

329-3.

Concrete Tile *for* Land Drainage



Concrete for Permanence

Published by

Portland Cement Association

111 West Washington Street
Chicago

MAY, 1917

Concrete Tile for Land Drainage

Profits of Land Drainage

During recent years there has been a better understanding of the profits that may be expected from well-planned land drainage. The United States Department of Agriculture Year Book for 1914 mentions a 55-acre farm in the Piedmont section of North Carolina which was purchased in 1908 for \$1,900. Ditching was started the first year and tile drainage two years later. In 1913 the crops were worth \$2,000; in 1914 the owner refused \$5,000 for the farm.



Land in the Black Prairie belt, Ala. Typical cotton crop of only 2 to 6 bales of cotton on 20 acres because land needs drainage

Some years ago the Indiana Bureau of Statistics made an investigation to determine what profits might come from tile drainage, not only as related to increased crop yields, but also as regards community health. One township in the state, where drainage had been extensively developed, was used as a basis of this investigation.

It is a well-known fact that swamps or swamp lands are not good home sites except for mosquitoes, and these pests are responsible for malaria. In five years after most of the Indiana township above mentioned had been properly tile drained, the average acre yield of wheat had more than doubled. The yield of corn was also more than double, having risen from $31\frac{1}{4}$ to $74\frac{1}{4}$ bushels per acre.



The same land shown in the preceding picture after drained. Productiveness increased to 26 bales of cotton on 20 acres

Increase in the healthfulness of the community was indicated in reports from doctors. In the five years preceding drainage there had been reported 1,480 cases of malarial disease, while in the five years following tile drainage only 490 such cases were reported. Everybody knows that being sick is expensive, which proves that there is profit in keeping well; so an investment that will safeguard health pays big dividends.

What Drainage Accomplishes

Many undrained lands, although they may not always show surface water, do at times support pools of water which become stagnant and disease breeding. Proper tile drainage does away with these pools. Drainage also helps to control soil moisture as well as to remove surplus water. Drained lands can be worked earlier in the season and will go through dry spells better than undrained soils. They will wash less during sudden downpours because drainage opens up the soil and allows it to absorb water, any surplus of which is then removed through the tile lines. Drainage aerates the land, thus producing a condition that helps to maintain an even supply of moisture for crops throughout the growing season.

Figuring the Profits of Drainage

In order to arrive at the actual money value probable from a well-developed drainage system, one can start by assuming a number of conditions. There is no question but that drainage increases crop yields. Suppose, for example, the yield of corn on a certain drained

10 38-B9904 TCF

area is increased 25 bushels per acre. If the corn is worth 50 cents a bushel, the added return of \$12.50 is equal to a 10 per cent dividend on \$125. This shows that another way to figure the value of drainage is to consider the increased market value of the land, which is well illustrated in the example of the North Carolina farm previously mentioned.

Many Large Drainage Projects Under Way

As a result of the profits from well-planned drainage systems, many such large projects have been promoted or are under way. Not long ago work was started on a drainage project near Muscatine, Iowa, which will use 47 miles of concrete pipe and tile ranging from 10 to 27 inches in diameter. 37 miles of concrete tile from 8 to 30 inches in



Another example of necessity for drainage. Pipe distributed ready for laying and machine about to start trench. This land has become so clogged from lack of drainage that weeds grow better on it than corn

diameter were used on a similar work near Madison, Wis. A drainage district in Sevier County, Utah, is using 270 miles of concrete tile ranging from 5 to 15 inches in diameter. Many drainage projects in Minnesota and Iowa were successfully started in 1916, ten or more of which are using concrete pipe and tile exclusively, the quantities ranging from 5 to 30 miles, in sizes from 4 to 40 inches in diameter.

Irrigated Lands Reclaimed by Drainage

Within the last few years it has been found that many of the irrigated lands in the West have become water-logged through long

flooding, and the only way to restore their productiveness is to drain them. A number of extensive developments of this kind are now under way. At Corinne, Utah, many thousand acres of water-logged, irrigated lands are being drained in what is known as the Corinne District. Over 218 miles of concrete pipe and tile from 4 to 18 inches in diameter are going into this work.

Disadvantages of Open Ditches

Early methods of land drainage usually followed the practice of digging open ditches and laterals. Experience has proved such methods of attempting to lead surplus soil water away are very unsatisfactory. As a rule, open-ditch drainage systems in flat country do not have outlets low enough to reduce the water level in the soil. Water simply stands in the open channels and the possible benefits of drainage are not secured, although flood water is led away.



Soil erosion resulting from open drainage channel

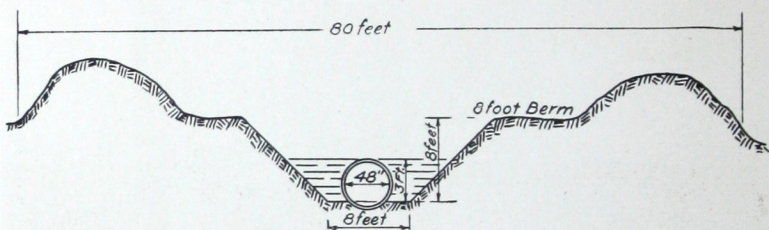
In addition, open ditches occupy considerable land and prevent its cultivation. They also require cleaning out perhaps several times each year to keep them in working order. They naturally must follow more or less closely the different slopes of the land, so they cut the fields up into irregular shaped patches that make cultivation more difficult and expensive. They also prevent easy movement of farm machinery or

equipment from one field to another unless small culverts are built over trenches and bridges are built over large ditches.

More important even than the foregoing objection is that rapid soil washing and gullying of the ditch when heavy rainfall makes it necessary for the waterways to carry off large quantities of water, soon completely destroys the ditches and removes more land from cultivation. Ditches and trenches cannot be worked up too closely when cultivating crops; therefore, strips along such open channels soon become weed beds.

Replacing the Large Open Ditch With Concrete Pipe

The diagram below illustrates how readily concrete pipe 48 inches in diameter can be made to replace an open ditch that keeps out of cultivation a strip of land approximately 80 feet wide. Nor is it certain that such an open ditch will always confine its path to a strip of the width mentioned. Large quantities of water falling during



This diagram illustrates the amount of land withdrawn from profitable cultivation where open ditches are used. In this view it is shown how a 48-inch concrete pipe will replace a ditch 8 feet wide at the bottom and carrying 3 feet of water, thus permitting cultivation of a strip of land 80 feet wide otherwise entirely lost

heavy rainstorms may wash more soil away. Each year the washing and soil erosion make the open ditch less effective and more of a nuisance and expense.

Loss Caused by the Open Ditch

Why should any farmer be deprived of the income that he could get from an 80-foot strip running the entire distance across his farm? Such a strip means an acre of land every 544 feet. If this strip is occupied by a ditch running 80 rods through one farm, 2.43 acres are lost. If the land is worth \$200 an acre, there is \$486 invested in land that is not only paying no profit, but eating up money every year in taxes and interest on the money invested. Land worth \$200 an acre should earn 5 per cent, or \$10 an acre. In 50 years this loss for 2.43

acres is \$1,215, which represents actual cash taken out of the owner's pocket. In reality the loss is more than this because the value of the land is lost and the taxes are lost.

Many persons have been surprised to know how large an open ditch can be successfully replaced by tile of comparatively small diameter. Only in those cases where a drainage project may involve reclaiming vast areas of flat lowlands, where the volume of water to be handled exceeds the capacity of the largest sizes of concrete pipe obtainable, should the open ditch be considered. Careful measurement of the quantity of water flowing in many open drainage channels will prove that the ditch was only an apparent necessity, not a real one.

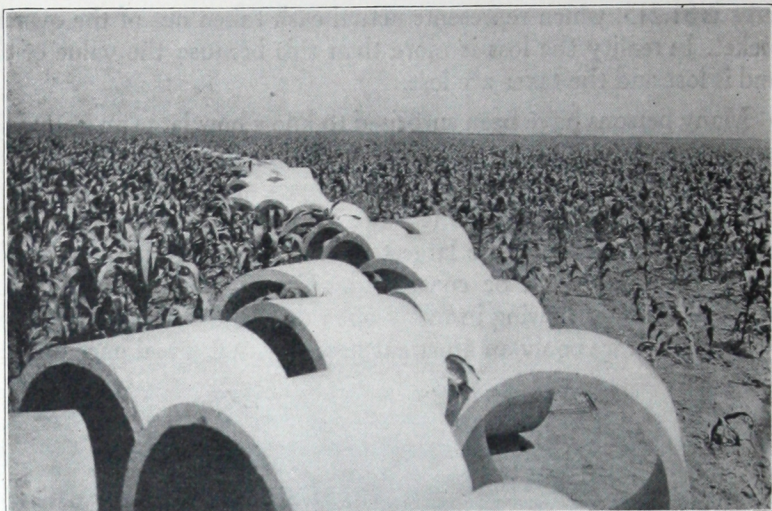


Concrete drain tile in cement products plant storage yard. Such tile are proof against destruction by frost

Advantages of Concrete Pipe and Tile

Concrete pipe and tile have been used in land drainage for many years, although not always so extensively nor to such good advantage as they might have been. Nothing is superior, if equal, to concrete pipe and tile. They are always true to shape, therefore easy to lay with close joints so that earth will not get into the tile line and clog it. They are in every way best for land drainage. They do not disintegrate under frost action. Being straight and free from warp, with true joints, they are easy to lay to true line in the trench.

Concrete tile drains may be laid to steeper grade than open waterways because a tile line furnishes a permanent channel that prevents



36-inch concrete pipe distributed ready for laying. The stunted growth of corn shown in this picture indicates necessity for reclamation by drainage

water from washing away the soil; in fact, the increased grade possible with underground drains causes the water to flow from the soil more rapidly.

Cost of Tile Drainage

The cost of drainage varies according to conditions and localities, but a swamp has little value. Once cleared and properly drained, it has a distinct value. Any farmer can compute this value himself; from an unprofitable patch eating up taxes and having no actual sale value, it steps into the ranks of a producing area. Concrete tile drainage will put any swampy "back forty" in the producing class.

Buy Tile From a Well-equipped Cement Products Plant

The farmer should not attempt to manufacture his own concrete pipe or tile. Experience and special equipment are necessary to produce pipe or tile of high grade. Well-equipped concrete products plants should be patronized when concrete pipe or tile are needed.



Another open channel showing large area of land withheld from cultivation by progressive wash and soil erosion

Drainage Systems Should be Carefully Planned

The following paragraphs are taken from the 1914 Year Book of the United States Department of Agriculture. They draw attention to a number of very important points which should be given careful consideration when planning and carrying out a drainage system.

“A careful business man in making investments considers security first and dividends afterwards; it is the gambler that takes chances, risking in play for high stakes. The man of small capital least of all can afford to expend money without certainty of the returns, yet it is he who most often economizes by undertaking drainage work without expert assistance. The wonder is not that a considerable amount of money spent for drainage has been lost, but that so much of it has been profitable. To determine the most economical plan of drainage usually requires engineering judgment of no mean order and a thorough knowledge of the drainage properties of soils. One not experienced in this kind of work should not take the responsibility of planning any considerable expenditure for drainage. There are many farm owners that realize the need of drainage, but have not the means to do a great

deal of work at a time, and therefore are loath to pay for the services of a drainage engineer to determine what work is needed, and to plan it so that it not only will cost least in the end, but also can be constructed in an orderly and economical manner.

"Before other expenditures are made there should be a careful survey examination to determine the source of the water to be removed and its amount, the most economical arrangement of the drains, the grades obtainable and the proper sizes of drains, and the amounts of tile and of labor. The cost of drainage can then be estimated quite closely by one acquainted with work of this kind. Sometimes only a few drains are needed in the lowest parts of the field; sometimes a uniform system is required with parallel lines underlying the whole area. In the latter case experienced judgment is needed to decide what will be the proper depth and spacing for each kind of soil.



Hand trenching preparatory to laying line of small concrete tile



Concrete tile are easy to lay to true line in the trench

The Work Must Have Proper Supervision

"Construction work should be carefully done, under the supervision of some one at least qualified to see that the tile are laid according to the grades established by the engineer who planned the work. The tile must be laid to true grade and alignment, for very slight irregularities

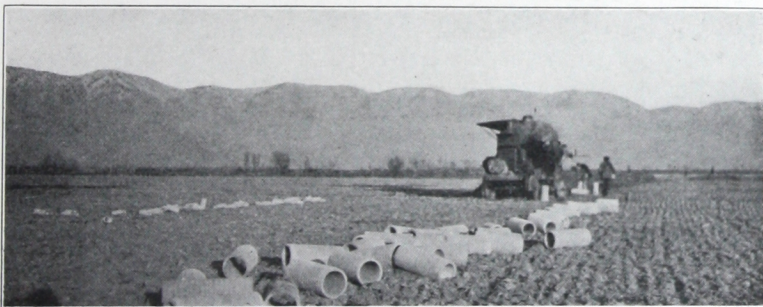


One of the several types of trenching and tile laying machines, excavating trench and laying 36-inch concrete pipe

will retard the flow and permit dirt to fall into the drain. Many a drain has been choked by sediment deposited very gradually in a slight sag which could hardly be detected by the unaided eye. The employment of a competent drainage engineer to plan the drainage system and to supervise construction in the end will be the most profitable part of the investment."

What Other Information Can We Give You?

If you are not familiar with all the advantages of concrete pipe and tile, we shall be very glad to discuss further with you their merits; also refer you to reliable manufacturers of pipe and tile who can supply you with a product of high quality—one that has no equal for economy and permanence in drainage work.

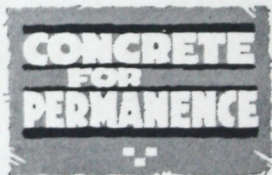


Start of work on reclaiming by drainage part of the first area of land irrigated in Utah. This land has been irrigated for so many years that the soil has become clogged and now drainage is necessary to restore it. This is in the Corinne District, Utah

Concrete pipe and tile are but two of a number of superior concrete products.

Concrete sewer pipe, concrete block, concrete brick, concrete fence posts, concrete lamp posts and such concrete units as lintels, sills and porch columns, deserve your attention.

Our **Cement Products Bureau** will be glad to tell you what you would like to know about these uses of concrete.



Portland Cement Association

General Office

111 West Washington Street, Chicago

Offices at

ATLANTA

Hurt Building

DALLAS

Southwestern Life Building

DENVER

Ideal Building

INDIANAPOLIS

Merchants Bank Building

KANSAS CITY

Rialto Building

MILWAUKEE

First National Bank Building

NEW YORK

101 Park Avenue

PARKERSBURG, W. VA.

Union Trust Building

PITTSBURGH

Farmers Bank Building

SALT LAKE CITY

Kearns Building

SAN FRANCISCO

Rialto Building

SEATTLE

Northern Bank & Trust Building